

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference SMC 60622WO		FOR FURTHER ACTION		See Form PCT/PEA/416
International application No. PCT/GB2004/004186		International filing date (day/month/year) 01.10.2004		Priority date (day/month/year) 25.10.2003
International Patent Classification (IPC) or national classification and IPC C23F1/02, C09D11/00, H05K3/06				
Applicant AVECIA INKJET LIMITED et al.				
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau) a total of 3 sheets, as follows:</p> <p><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>				
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>				
Date of submission of the demand 22.08.2005		Date of completion of this report 12.10.2005		
Name and mailing address of the International preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized Officer Mauger, J Telephone No. +49 89 2399-8447		



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International application No.
PCT/GB2004/004186

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language, which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1-21 as originally filed

Claims, Numbers

1-21 received on 22.08.2005 with letter of 27.07.2005

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

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Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-20
	No: Claims	21
Inventive step (IS)	Yes: Claims	1-20
	No: Claims	21
Industrial applicability (IA)	Yes: Claims	1-29
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item V.

- 1) The following documents are referred to in this communication:
D1 : EP 0 659 038 A (CANON KK) 21 June 1995 (1995-06-21)
D2 : WO 95/23244 A (MUHL JONATHON ; UNIV EDINBURGH (GB)) 31 August 1995 (1995-08-31)
D3 : US 4 767 489 A (LINDNER FREDERICK H) 30 August 1988 (1988-08-30)
D4 : US-A-4 536 468 (AKAIKE AKIHIKO ET AL) 20 August 1985 (1985-08-20)
- 2) Claim 21 defines etched metal articles obtainable by the present process. The articles as such are conventional. The present invention concerns a process where the resist used is of primary importance. The resist is not required to be present in the products of claim 21. It is also clear to a skilled person that as a rule the resist will not persist in the final product. Nothing in the application suggests that etched articles produced by the present process are distinguishable from etched articles obtained using other processes such as the processes of documents D1-D4 or processes using conventional photolithographic techniques. Thus the subject-matter of claim 21 is thus both trivial and not novel (Article 33(2) PCT).
- 3) Document D1 (see page 3, line 1 to page 6, line 29 and claims) discloses etching resist compositions which are applied from ink-jet printers and hardened by solvent (typically water) removal. The composition has a viscosity below 10 cPs and contains a resin with an acid value of at least 35 neutralised with a base and optionally a surfactant and/or a colorant. Bases mentioned include polyamines. Resins neutralised with polyamines will contain chelating groups. The resist is strippable by a strong alkali

The subject-matter of claims 1-20 is novel with respect to the disclosure of document D1 because the claims require that the resist is a hot melt ink. Hot melt inks have different chemical composition from the resist disclosed in document D1.

- 3.1) Resists for use in etching metals based on hot-melt inks for application by ink-jet printing are disclosed in documents D2 (whole document) and D3 (column 6, line 43 - column 7, line 21 and claims). Documents D2 and D3 do not disclose the use of

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resins containing chelating groups. Thus the subject-matter of claims 1-20 is also novel with respect to the disclosure of documents D2 and D3.

The problem in view of these documents is to provide processes using a resist which enables a very fine etch pattern to be obtained and that is readily stripped.

It is known that when forming resist patterns on a substrate by lithographic printing similar problems may be solved by the use of a resist containing a resin with chelating groups (see document D4, column 1, lines 1-37, claims and examples). Document D4 does not however relate to hot-melt inks, or inkjet printing and uses resists which chemically differ considerably from hot-melt inks. It would thus not be obvious to a skilled person to consult document D4 when seeking to solve the present problem in hot melt inks.

Thus the subject-matter of claims 1-20 is considered to be inventive (Article 33(3) PCT).

CLAIMS

1. A process for etching a metal or alloy surface which comprises applying a hot melt etch-resist ink by ink jet printing to selected areas of the metal or alloy, solidifying the etch-resist ink by cooling and then removing the exposed metal or alloy by a chemical etching process wherein the hot melt etch-resist ink comprises the components:

A) 60 to 100 parts carrier vehicle comprising one or more components which contain at least one metal chelating group;

B) 0 to 40 parts colorant; and

C) 0 to 5 parts surfactant;

wherein the ink has a viscosity of not greater than 30 cPs (mPa.s) at the firing temperature, all parts are by weight and the total number of parts A)+B)+C) = 100.

2. A process as claimed in claim 1 wherein the metal chelating group(s) are selected from the group consisting of ketoximines; acetaryl amides; hydroxy silanes and alkoxy silanes; aryl or heteroaryl hydroxides; N-containing heterocycles; acid anhydrides; β -diketones, β -keto esters, β -keto aldehydes, β -keto heterocycles; and acid groups.

3. A process as claimed in claim 1 wherein the metal chelating group(s) are selected from the group consisting of imidazoles, benzimidazoles, triazoles, benzotriazoles, thiazoles and isothiazoles.

4. A process as claimed in claim 1 wherein the metal chelating group(s) are selected from the group consisting of β -diketones, β -keto esters, β -keto aldehydes and β -keto heterocycles.

5. A process as claimed in claim 1 wherein the metal chelating group(s) are acid groups:

6. A process as claimed in claim 5 wherein the acid groups are selected from the group consisting of carboxylic acid, phosphoric acid, polyphosphoric acid, phosphonic acid, sulphuric acid and sulphonic acid groups.

7. A process as claimed in claim 5 wherein the acid groups are carboxylic acid groups.

8. A process as claimed in claim 1 wherein the carrier vehicle comprises two or more types of metal chelating groups wherein at least one of the metal chelating groups is an acid group and at least one of the metal chelating groups is not an acid group.

9. A process as claimed in any one of claims 1 to 8 wherein the colorant is a pigment.

10. A process as claimed in any one of claims 1 to 9 wherein the colorant is blue.

11. A process as claimed in any one of claims 1 to 10 wherein the etch-resist ink has been filtered through a filter having a pore size of 1 micron.

12. A process as claimed in any one of claims 1 to 11 wherein the viscosity of the etch-resist ink is from 8 to 15 cPs (mPa.s) at the firing temperature.

13. A process as claimed in any one of claims 1 to 12 wherein the firing temperature is from 50 to 150°C.

14. A process as claimed in claim 1 wherein at least one component of the carrier vehicle contains at least one acid metal chelating group and the etch-resist ink has an acid value from 40 to 150mg KOH/g.

15. A process as claimed in any one of claims 1 to 14 wherein the metal or alloy is iron or a ferro alloy.

16. A process as claimed in claim 1 wherein the carrier vehicle comprises a wax or polyamide polymer or a mixture thereof.

17. A process as claimed in any one of the preceding claims wherein the etching fully penetrates the metal or alloy.

18. A process as claimed in any one of claims 1 to 17 wherein the solidified etch-resist is removed after etching.

19. A process as claimed in claim 18 wherein the solidified etch-resist is removed by treatment with an alkaline medium.

20. An etched metal or alloy partially coated with a solidified etch-resist made by the process as claimed in any one of claims 1 to 17.

21. A grid, a filter, a graticule, a mesh, a light chopper disc, a heat sink plate, a heater element, a screen, colour TV mask, a diaphragm, a shim, a gasket, a washer, a spring, a link, a probe, a magnetic recording head, a circuit lead frame, an encoder disc, an item of jewellery, a rule, a scale, a clutch plate, an emitter contact, a micro reactor, a suspension lead, an ink jet nozzle plate, a stencil, a razor foil, a bearing, an edge filter, a logo, a

nameplate, a decorative plaque, an instrument case, a box, an enclosure and a potentiometer case having a chemically etched surface pattern or design made by a process as claimed in any one of claims 1 to 17.